

## CLAIMS

1. An audio user-interfacing method in which items are represented in an audio field by  
5 corresponding synthesized sound sources from where sounds related to the items appear to  
emanate, the method comprising the steps of:
- (a) specifying a division of the audio field into multiple segments; and
  - (b) in response to a predetermined user input indicative of at least one said segments,  
10 selectively changing the audibility of the synthesised sound sources in said at least one  
segment.
2. A method according to claim 1, wherein step (b) involves changing the audibility of the  
synthesised sound sources in said at least one segment from un-muted to at least partially  
15 muted.
3. A method according to claim 2, wherein changing the audibility of the sound sources in  
a said segment from un-muted to at least partially muted leaves the audibility of sound  
sources in the other segments unchanged.
- 20 4. A method according to claim 2, wherein changing the audibility of the sound sources in  
a said segment from un-muted to an at least partially muted causes any previously at-least-  
partially muted sound sources in other segments to become un-muted.
5. A method according to claim 1, wherein the audibility of sound sources that have been  
25 at least partially muted as a result of said predetermined input, automatically returns to un-  
muted after a predetermined period.
6. A method according to claim 1, wherein step (b) involves changing the audibility of the  
synthesised sound sources in said at least one segment from at least partially muted to un-  
30 muted.

7. A method according to claim 6, wherein changing the audibility of the sound sources in a said segment from at least partially muted to un-muted leaves the audibility of sound sources in the other segments unchanged.
- 5 8. A method according to claim 6, wherein changing the audibility of the sound sources in a said segment from at least partially muted to un-muted causes any previously un-muted sound sources in other segments to become at least partially muted.
9. A method according to claim 6, wherein the audibility of sound sources that have been  
10 un-muted as a result of said predetermined input, automatically returns to at least partially muted after a predetermined period.
10. A method according to claim 1, wherein the audio field is notionally divided in azimuth and /or elevation to form said segments.
- 15 11. A method according to claim 1, wherein the segments are specified relative to a current direction of facing of the user with the latter being assumed to be in a reference position.
- 20 12. A method according to claim 1, wherein the segments are specified relative to a presentation reference determined by a mounting configuration of audio output devices used to synthesise said sound sources.
13. A method according to claim 1, wherein the segments are specified relative to an audio  
25 field reference that can be rotated relative to a presentation reference determined by a mounting configuration of audio output devices used to synthesise said sound sources.
14. A method according to claim 1, wherein the specification of the segments is set by user input.
- 30 15. A method according to claim 1, wherein the segments have a default specification.

16. A method according to claim 1, wherein the sound sources are arranged in groups with each group being associated with a respective audio-field reference relative to which the sound sources of the group are positioned, the audio-field references being independently movable relative to a presentation reference which is determined by a mounting configuration of audio output devices used to synthesise said sound sources; the change in audibility of sound sources of a segment caused by said predetermined user input being applied to sound sources of all said groups.

17. A method according to claim 1, wherein the sound sources are arranged in groups with each group being associated with a respective audio-field reference relative to which the sound sources of the group are positioned, the audio-field references being independently movable relative to a presentation reference which is determined by a mounting configuration of audio output devices used to synthesise said sound sources; the change in audibility of sound sources of a segment caused by said predetermined user input being applied to sound sources of a selected one or more of said groups.

18. A method according to claim 1, wherein the audibility of sound sources in multiple segments is changed by the same said user input.

19. A method according to claim 1, wherein the audio field is stabilised relative to one of:

- a user's head;
- a user's body;
- a vehicle in which the user is travelling;
- the world;

this stabilisation taking account of whether audio output devices used to synthesise the sound sources are world, vehicle, body or head mounted, and, as appropriate, rotation of the user's head or body, or turning of the vehicle.

20. A method according to claim 1, wherein at least some of the said items represented by the sound sources are audio labels for services, the method further involving selecting a service by selecting the corresponding audio-label sound source.

**21.** Apparatus for providing an audio user interface in which items are represented in an audio field by corresponding synthesized sound sources from where sounds related to the items appear to emanate, the apparatus comprising:

- storage means for storing segmentation data specifying a division of the audio field into multiple segments;
- input means for receiving a predetermined user input indicative of at least one said segments for which the audibility of the sound sources encompassed thereby is to be changed;
- rendering-position determining means for determining, for each said sound source, an associated rendering position at which the sound source is to be synthesized to sound in the audio field;
- audibility-determining means for determining the audibility of each sound source based on its rendering position, the segmentation data, and said user input; and
- rendering means, including audio output devices, for generating an audio field in which said sound sources are synthesized at their associated rendering positions and with audibility as determined by said audibility determining means.

**22.** Apparatus according to claim 21, wherein the audibility-determining means is responsive to said predetermined user input to change the audibility of the synthesised sound sources in said at least one segment from un-muted to at least partially muted.

**23.** Apparatus according to claim 22, wherein the audibility-determining means, in changing the audibility of the sound sources in a said segment from un-muted to an at least partially muted, is further operative to set the audibility of any previously at-least-partially muted sound sources in other segments to un-muted.

**24.** Apparatus according to claim 22, wherein the audibility-determining means is further operative to automatically return the audibility of sound sources that have been at least partially muted as a result of said predetermined input, to un-muted after a predetermined period.

25. Apparatus according to claim 21, wherein the audibility-determining means is responsive to said predetermined user input to change the audibility of the synthesised sound sources in said at least one segment from at least partially muted to un-muted.

5 26. Apparatus according to claim 25, wherein the audibility-determining means, in changing the audibility of the sound sources in a said segment from at least partially muted to un-muted, is further operative to set the audibility of any previously un-muted sound sources in other segments to at-least-partially muted.

10 27. Apparatus according to claim 25, wherein the audibility-determining means is further operative to automatically return the audibility of sound sources that have been un-muted as a result of said predetermined input, to at least partially muted after a predetermined period.

15 28. Apparatus according to claim 21, wherein the segmentation data divides the audio field into segments specified relative to a presentation reference determined by a mounting configuration of the audio output devices, the rendering-position determining means being operative to determine the rendering positions of the sound sources relative to said presentation reference whereby the audibility-determining means can directly determine the  
20 segment location of a sound source by comparing the rendering position of the sound source with the segmentation data..

29. Apparatus according to claim 21, wherein the audio output devices are intended for mounting off the user's head and the apparatus further comprises a head tracking  
25 arrangement for determining the angular offset between the user's current direction of facing and a presentation reference determined by a mounting configuration of audio output devices; the segmentation data dividing the audio field into segments relative to a current direction of facing of the user and the rendering-position determining means being operative to determine the rendering positions of the sound sources relative to said  
30 presentation reference; the audibility-determining means being operative to use said angular offset to relate the segmentation data to the presentation reference whereby to enable the segment location of a sound source to be determined.

30. Apparatus according to claim 21, wherein the segmentation data divides the audio field into segments specified relative to an audio field reference, the apparatus further comprising offset means for controlling an offset between the audio field reference and a presentation reference determined by a mounting configuration of the audio output devices; the rendering-position determining means being operative to determine the rendering positions of the sound sources relative to said presentation reference; and the offset means being operative to provide a measure of said offset to the audibility-determining means with the latter being arranged to use this measure to relate the segmentation data to the presentation reference whereby to enable the segment location of a sound source to be determined.

31. Apparatus according to claim 21, including user-operable input means for modifying said specification data.

32. Apparatus according to claim 21, wherein at least some of the said items represented by the sound sources are audio labels for services, the apparatus including a selection arrangement for selecting a service by selecting the corresponding audio-label sound source.

33. Apparatus for providing an audio user interface in which items are represented in an audio field by corresponding synthesized sound sources from where sounds related to the items appear to emanate, the apparatus comprising:

- a data store arranged to store segmentation data specifying a division of the audio field into multiple segments;
- an input arrangement operative to receive a predetermined user input indicative of at least one said segments for which the audibility of the sound sources encompassed thereby is to be changed;
- a rendering-position determining arrangement operative to determine, for each said sound source, an associated rendering position at which the sound source is to be synthesized to sound in the audio field;
- an audibility-determining arrangement operative to determine the audibility of each

sound source based on its rendering position, the segmentation data, and said user input; and

- a rendering subsystem, including audio output devices, arranged to generate an audio field in which said sound sources are synthesized at their associated rendering positions and with audibility as determined by said audibility determining arrangement.

34. Apparatus according to claim 33, wherein the audibility-determining arrangement is responsive to said predetermined user input to change the audibility of the synthesised sound sources in said at least one segment from un-muted to at least partially muted.

35. Apparatus according to claim 34, wherein the audibility-determining arrangement, in changing the audibility of the sound sources in a said segment from un-muted to an at least partially muted, is further operative to set the audibility of any previously at-least-partially muted sound sources in other segments to un-muted.

36. Apparatus according to claim 34, wherein the audibility-determining arrangement is further operative to automatically return the audibility of sound sources that have been at least partially muted as a result of said predetermined input, to un-muted after a predetermined period.

37. Apparatus according to claim 33, wherein the audibility-determining arrangement is responsive to said predetermined user input to change the audibility of the synthesised sound sources in said at least one segment from at least partially muted to un-muted.

38. Apparatus according to claim 37, wherein the audibility-determining arrangement, in changing the audibility of the sound sources in a said segment from at least partially muted to un-muted, is further operative to set the audibility of any previously un-muted sound sources in other segments to at-least-partially muted.

39. Apparatus according to claim 38, wherein the audibility-determining arrangement is further operative to automatically return the audibility of sound sources that have been un-

muted as a result of said predetermined input, to at least partially muted after a predetermined period.

40. Apparatus according to claim 33, wherein the segmentation data divides the audio field into segments specified relative to a presentation reference determined by a mounting configuration of the audio output devices, the rendering-position determining arrangement being operative to determine the rendering positions of the sound sources relative to said presentation reference whereby the audibility-determining arrangement can directly determine the segment location of a sound source by comparing the rendering position of the sound source with the segmentation data..

41. Apparatus according to claim 33, wherein the audio output devices are intended for mounting off the user's head and the apparatus further comprises a head tracking arrangement for determining the angular offset between the user's current direction of facing and a presentation reference determined by a mounting configuration of audio output devices; the segmentation data dividing the audio field into segments relative to a current direction of facing of the user and the rendering-position determining arrangement being operative to determine the rendering positions of the sound sources relative to said presentation reference; the audibility-determining arrangement being operative to use said angular offset to relate the segmentation data to the presentation reference whereby to enable the segment location of a sound source to be determined.

42. Apparatus according to claim 33, wherein the segmentation data divides the audio field into segments specified relative to an audio field reference, the apparatus further comprising a control arrangement for controlling an offset between the audio field reference and a presentation reference determined by a mounting configuration of the audio output devices; the rendering-position determining arrangement being operative to determine the rendering positions of the sound sources relative to said presentation reference; and the control arrangement being operative to provide a measure of said offset to the audibility-determining arrangement with the latter being arranged to use this measure to relate the segmentation data to the presentation reference whereby to enable the segment location of a sound source to be determined.



43. Apparatus according to claim 33, including user-operable input device for modifying said specification data.
- 5 44. Apparatus according to claim 33, wherein at least some of the said items represented by the sound sources are audio labels for services, the apparatus including a selection arrangement for selecting a service by selecting the corresponding audio-label sound source.